

(f) Ship staff training must include familiarization in the operation and the maintenance of the equipment.

(g) The routine maintenance of the monitoring system and troubleshooting procedures must be clearly defined in the Operating and Maintenance Manual. All routine maintenance and repairs must be recorded.

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§ 157.12d Technical specifications.

(a) *Oil discharge monitoring and control system.* (1) The monitoring system must be capable of effectively monitoring and controlling the discharge of any effluent into the sea through those overboard discharge outlets permitted by § 157.11 that are necessary to fulfill the operational requirements of the oil tanker.

(2) The discharge of dirty ballast water or other oil-contaminated water from the cargo tank areas into the sea through outlets, which are not controlled by the monitoring system is prohibited.

(3) The monitoring system must function effectively under all environmental conditions normally encountered by oil tankers, and must be designed and constructed to satisfy the specifications for approval in 46 CFR subpart 162.050. Moreover—

(i) The system must be designed so a discharge of dirty-ballast or other oil-contaminated water from the cargo tank areas cannot take place unless the monitoring system is in the normal operating mode and the relevant sampling point has been selected;

(ii) The system should sample the effluent discharge from a minimum number of discharge outlets and be arranged so that discharge overboard can take place via only one outlet at a time;

(iii) Where it is intended that more than one line be used for simultaneous discharging purposes, one oil content meter, together with a flow meter, must be installed in each discharge line. These instruments must be connected to a common processor; and

(iv) To avoid alarms because of short-term high-oil-concentration signals (spikes) causing indications of high instantaneous rates of discharge, the short-term high ppm signal may be

suppressed for a maximum of 10 seconds. Alternatively, the instantaneous rate of discharge may be continuously averaged during the preceding 20 seconds or less as computed from instantaneous ppm values of the oil content meter readings received at intervals not exceeding 5 seconds.

(4) The monitoring system must comprise—

(i) An oil content meter to measure the oil content of the effluent in ppm. The meter must be approved in accordance with the provisions contained in 46 CFR subpart 162.050 and certified to take into account the range of cargoes carried;

(ii) A flow rate indicating system to measure the rate of effluent being discharged into the sea;

(iii) A ship speed indicating device to give the ship's speed in knots;

(iv) A ship position indicating device to give the ship's position-latitude and longitude;

(v) A sampling system to convey a representative sample of the effluent to the oil content meter;

(vi) An overboard discharge control to stop the overboard discharge;

(vii) A starting interlock to prevent the discharge overboard of any effluent unless the monitoring system is fully operational; and

(viii) A control section comprising—

(A) A processor that accepts signals of oil content in the effluent, the effluent flow rate, and the ship's speed, and computes these values into liters of oil discharged per nautical mile and the total quantity of oil discharged;

(B) A means to provide alarms and command signals to the overboard discharge control;

(C) A recording device to provide a record of data required under § 157.12d(h)(2);

(D) A data display to exhibit the current operational data required under § 157.12d(i);

(E) A manual override system to be used in the event of failure of the monitoring system;

(F) A means to provide signals to the starting interlock to prevent the discharge of any effluent before the monitoring system is fully operational; and

(G) The control section of the monitoring system must be tested in accordance with the vibration testing requirements described in 46 CFR 162.050-37.

(5) Each main component of the monitoring system must be fitted with a name plate, properly identifying the component by assembly drawing number, type or model number, and serial number, as appropriate.

(6) The electrical components of the monitoring system that are to be installed in an explosive atmosphere must be in compliance with 46 CFR 162.050-25.

(7) Each main component of the monitoring system must be designed in accordance with the applicable requirements contained in subchapters F and J.

(b) *Sampling system.* (1) Sampling points must be located so relevant samples can be obtained from those outlets used for operational discharges in accordance with paragraph (a) of this section. The sampling probes located in the overboard discharge lines and the piping system connecting the sampling probes to the oil content meter must meet the requirements of this paragraph.

(2) The piping and probes must be—

(i) Of a material resistant to fire, corrosion, and oil; and

(ii) Of adequate strength and properly jointed and supported.

(3) The system must have a stop-valve fitted adjacent to each probe, except that, where the probe is mounted in a cargo line, two stop-valves must be fitted, in series, in the sample line. One of these may be the remote controlled sample selector valve.

(4) Sampling probes must be arranged for easy withdrawal and must, as far as practicable, be mounted at an accessible location in a vertical section of the discharge line. Should it be necessary to fit sampling probes in a horizontal section of the discharge line it must be ascertained, during the installation survey, that the pipe runs full of liquid at all times during the discharge of the effluent. Sampling probes must normally penetrate inside the discharge pipe to a distance of one quarter the diameter of that pipe.

(5) Means must be provided for cleaning the probes and piping system by the provision of permanent clean water flushing arrangements or an equivalent method. The design of the probes and piping must be such as to minimize their clogging by oil, oily residue, and other matter.

(6) The velocity of the fluid in the piping must be such that, taking into consideration the length of the piping, the overall response time must be as short as possible between an alteration in the mixture being pumped and the alteration in the oil content meter reading. In no case should the response time, including the response time of the oil content meter, be more than 40 seconds.

(7) The location of sampling probes in relation to any point of flow diversion to a slop tank must be selected with regard to the need for sampling the oily water in the recirculation mode.

(8) The arrangements for driving the sampling pump or any other pumps used in the system must account for the safety requirements of the space in which the pump is located. Any bulk-head penetration between a hazardous and a non-hazardous area must be of a design meeting the requirements of 46 CFR 32.60-20 and 46 CFR subpart 111.105.

(9) The flushing arrangement must be such that where necessary it can be utilized for test-running and stabilizing the oil content meter and correcting for zero setting.

(10) Sample water returning to the slop tank must not be allowed to free-fall into the tank. In tankers equipped with an inert gas system, a water seal meeting the requirements of 46 CFR 32.53-10(b) must be arranged in the piping leading to a slop tank.

(11) A valve must be provided for the manual collection of samples from the inlet piping to the oil content meter at a point downstream of any sampling pump.

(c) *Flow rate indicating system.* (1) A flow meter for measuring the rate of discharge must be installed in a vertical section of a discharge line or in any other section of a discharge line as appropriate, so as to be always filled with the liquid being discharged.

(2) A flow meter must employ an operating principle which is suitable for shipboard use and, where relevant, can be used in large diameter pipes.

(3) A flow meter must be suitable for the full range of flow rates that may be encountered during normal operation. Alternatively, arrangements such as the use of two flow meters of different ranges or a restriction of the operational flow rate range may be employed if necessary to meet this requirement.

(4) The flow meter, as installed, must have an accuracy of ± 10 percent, or better, of the instantaneous rate of discharge throughout the operating range for discharging the effluent.

(5) Any component part of the flow meter in contact with the effluent should be of corrosion-resistant and oil-resistant material of adequate strength.

(6) The design of the flow metering arrangements must account for the safety requirements of the space in which such metering arrangements are located.

(d) *Ship's speed indicating system.* The automatic speed signal required for a monitoring system must be obtained from the ship's speed indicating device by means of a repeater signal. The speed information used may be either speed over the ground or speed through the water, depending upon the speed measuring equipment installed on board.

NOTE TO PARAGRAPH (d): See "Recommendation on Performance Standards for Devices to Indicate Speed and Distance," Annex to resolution A.824(19) as amended by resolution MSC.96(72).

(e) *Ship position indicating device.* The ship position indicating device must consist of a receiver for a global navigation satellite system, a terrestrial radio navigation system, or other means suitable for use at all times throughout the intended voyage to establish and update the ship's position by automatic means.

(f) *Overboard discharge control management.* The overboard discharge control must be able to stop the discharge of the effluent into the sea automatically by either closing all relevant overboard discharge valves or stopping all relevant pumps. The discharge control ar-

rangement must be fail-safe so that all effluent discharge is stopped when the monitoring system is not in operation, at alarm conditions, or when the monitoring system fails to function.

(g) *Processor and transmitting device.* (1) The processor of a control section must receive signals from the oil content meter, the flow rate indicating system and the ship's speed indicating system at time intervals not exceeding 5 seconds and must automatically compute the following:

(i) Instantaneous rate of discharge of oil in liters per nautical mile; and

(ii) Total quantity of oil discharged during the voyage in cubic meters or liters.

(2) When the limits imposed by § 157.37(a)(3) and (4) are exceeded, the processor must provide alarms and provide command signals to the overboard discharge control arrangement, which will cause the discharge of effluent into the sea to stop.

(3) The processor must normally include a device for the continuous generation of time and date information. Alternative arrangements that ensure the automatic and continuous reception of time and date information from an external source may be approved by the Marine Safety Center.

(4) In the event of power failure the processor must retain its memory in respect to computation of the total quantity of oil discharged, time, and date. A printout of data must be obtained when the monitoring system is operating with manual override, but the printout of data is not required if, when the power fails, the monitoring system activates the overboard discharge control to stop the discharge of effluent.

(h) *Recording devices.* (1) The recording device of a control section must include a digital printer, which may be formatted electronically. The recorded parameters must be explicitly identified on the printout. The printout must be legible and must remain so once removed from the recording device and must be retained for at least 3 years.

(2) The data to be automatically recorded must include at least the following:

(i) Instantaneous rate of discharge of oil (liters per nautical mile);

§ 157.12e

33 CFR Ch. I (7-1-11 Edition)

- (ii) Instantaneous oil content (ppm);
 - (iii) The total quantity of oil discharged (cubic meters or liters);
 - (iv) Time and date (GMT, Greenwich Mean Time);
 - (v) Ship's speed in knots;
 - (vi) Ship's position—latitude and longitude;
 - (vii) Effluent flow rate;
 - (viii) Status of the overboard discharge control or arrangement;
 - (ix) Oil type selector setting, where applicable;
 - (x) Alarm condition;
 - (xi) Failure, including, but not limited to, fault or no flow; and
 - (xii) Override action, including, but not limited to, manual override, flushing, and calibration. Any information inserted manually as a result of an override action must be identified as such on the printout.
- (3) Data required in paragraph (h)(2) of this section must be printed out or may be stored electronically with printout capability, with the following minimum frequency:
- (i) When the discharge is started;
 - (ii) When the discharge is stopped;
 - (iii) At intervals of not more than 10 minutes (except when the system is in stand-by mode);
 - (iv) When an alarm condition develops;
 - (v) When normal conditions are restored;
 - (vi) Whenever the computed rate of discharge varies by 10 liters per nautical mile;
 - (vii) When zero-setting or calibration modes are selected; and
 - (viii) On manual command.
- (4) The recording device must be located in a position easily accessible to the person in charge of the overboard discharge operation.
- (i) *Data display.* (1) In addition to the recorded printout, the current data must be visibly displayed and at a minimum contain the following:
 - (i) Instantaneous rate of discharge of oil (liters per nautical mile);
 - (ii) Total quantity of oil discharged (cubic meters or liters);
 - (iii) Instantaneous oil content (ppm);
 - (iv) Flow rate;
 - (v) Ship's speed; and
 - (vi) Status of the overboard discharge control or arrangement.

(2) The data display must be located in a position easily observed by the person in charge of the overboard discharge operation.

(j) *Manually operated alternatives in the event of equipment malfunction.* Acceptable alternative means of obtaining information in the event of a failure in the monitoring system include the following:

- (1) Oil content meter or sampling system: Visual observation of the surface of the water adjacent to the effluent discharge;
- (2) Flow meter: Pump discharge characteristics;
- (3) Ship's speed indicating device: Main engine rpm;
- (4) Processor: Manual calculation and manual recording; and
- (5) Overboard discharge control: manual operation of pumps and valves.

(k) *Alarm conditions resulting in the stopping of discharge.* Audio-visual alarms must be activated for any of the following conditions and the monitoring system must be so arranged that the discharge of effluent into the sea is stopped:

- (1) Whenever the instantaneous rate of discharge of oil exceeds 30 liters per nautical mile;
- (2) When the total quantity of oil discharged reaches 1/30,000 of the previous cargo for new vessels and 1/15,000 for existing vessels; or
- (3) In the event of failure of the system's operation, such as:
 - (i) Power failure;
 - (ii) Loss of sample;
 - (iii) Significant failure of the measuring or recording system; or
 - (iv) When the input of any sensor exceeds the effective capacity of the system.

(l) *Location of alarm indicator.* The alarm indicator of the system must be installed in the cargo control room, where provided, and/or in other places where it will attract immediate attention and action.

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§ 157.12e Certificate of approval.

(a) A copy of the certificate of approval for the oil content meters must be carried aboard an oil tanker fitted with such equipment at all times.